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U.S. Department  
of Transportation

**National Highway  
Traffic Safety  
Administration**

DEPT. OF TRANSPORTATION

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# Memorandum

NHTSA-00-7013-55

Subject: Submittal to NHTSA Docket 2000-7013 of Ex Parte  
Information Received from the Toyota Motor Corporation  
Relating to Technical Workshop Issues

Date:

From: Edward Jettner *EJettner*  
Safety Standards Engineer

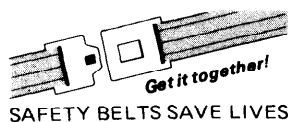
Reply to  
Attn. of:

To: *Richard M. Morgan*  
Thru: Richard Morgan  
Office of Crashworthiness Standards  
*John Womack for*  
John Womack  
Acting Chief Counsel

The attached information represents an additional set of recommendations submitted by Toyota regarding driver and passenger seat set-up and dummy positioning procedures. Please place this information in NHTSA docket 2000-7013.

Attachment

#



## FMVSS 208

### Test Conditions, Driver and Passenger Seat Set-up and Dummy Seating Positioning Procedures

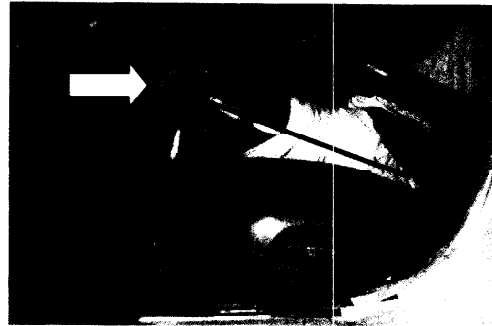
January 29, 2001

Toyota has the following recommendations for S16.2 and S16.3 of FMVSS 208 concerning dummy seating procedures for the 5<sup>th</sup> percentile female dummy.

#### 1) Driver Positioning – H. P., Seatback Angle, and Leg Angle Determination

##### a) S 16.3.2.1.6

This section instructs to push the knees until, “there is no gap between the pelvis and the seat back”, or until contact occurs between the dummy calves at the seat front so that the “angle between the dummy’s thighs and legs begins to change.” When using this method, the leg position depends on the engineer’s subjective judgement of “begins to change”. Therefore, the thigh/leg angle could be at an angle other than 90° and the position of the dummy varies.



##### b) S16.3.2.1.9

This section instructs to rotate the seat back forward until the transverse head instrumentation is level to  $\pm 0.5^\circ$ . However, if there is little distance from the seat front edge to the seat bite (i.e., dummy sits deep in seat), then the dummy is pushed forward by the seat when the seat back is rotated. This also can cause the knees to be pushed forward. In this case, as in a), the position varies.



##### c) S16.3.2.1.9, S16.3.2.1.12

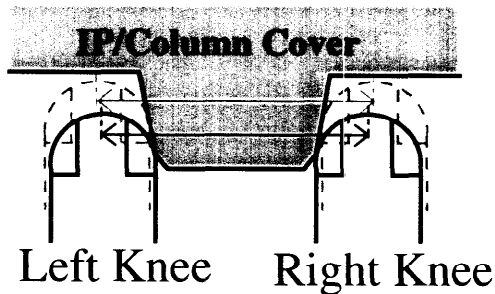
S16.3.2.1.12 instructs that if after positioning, the head is not level, then the seat back angle should be adjusted to minimize the angle of the head transverse plane. Per a) and b) above, if the dummy position varies, and the seat back angle now varies, the head may not be horizontally level.

**RECOMMENDATION:** The H.P. and seat back angle should be set at the manufacturer's suggested position. If after dummy positioning, the head transverse plane is not level within  $\pm 0.5^\circ$ , then the head should be adjusted at the lower neck bracket, instead of adjusting the seat back angle. Furthermore, the manufacturer should designate the seat track position in order to set the H.P. with the thigh/leg angle of  $90^\circ$ . Our experience shows that for some seat designs, the dummy, after initial positioning, the seat is moved forward and, the dummy knees interact with the steering wheel. In this case, the knees are repositioned to get around the wheel, which can effect the  $90^\circ$  thigh/leg angle. This is another reason why Toyota recommends that the manufacturer designate the seat position to set the dummy initially before moving it forward.

## 2) Knee Spacing

### a) S16.3.2.2.2, S16.3.2.2.3

These sections determine the spacing between the dummy knees to be 160mm - 170mm. However, if the knees interfere with the steering column cover (as seen in the sketch to the right), there is variability in the dummy position. Therefore the spacing should be set at 170mm instead of the range 160mm – 170mm.



### b) S16.3.2.1.8

For this initial position, the knee spacing is not prescribed (i.e., the sections described in a) above occur after this section in the procedure). Depending on the amount of initial knee spacing, the final position varies. For example, if the knees are initially shut together, the seat is stopped when the knees interact with the steering wheel. However, if the knees are initially spaced far apart, then the seat has the freedom to move further forward, without having the knees interact with the steering wheel.

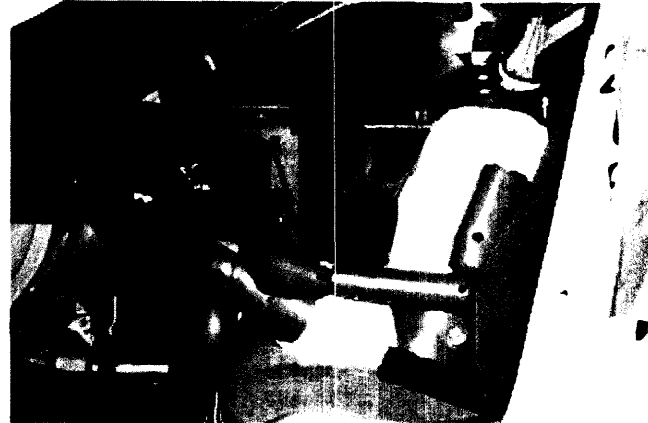


**RECOMMENDATION:** As explained in a) above, the initial knee spacing should be set at 170 mm. Furthermore, since the sections that determine knee spacing occur after the section described in b) above, the procedures need to

determine the knee spacing at the initial position. Toyota recommends the following procedure. The initial knee spacing should be set at 170 mm. When the seat is moved forward, if the knees interact with the steering wheel, then the knee spacing should be widened, the dummy should clear the wheel, and then reposition the knees spaced 170 mm apart. Then, after knee interaction with the IP, the seat should be moved back as instructed in S16.3.2.1.2.

### 3) Pelvic Angle

- a) S16.3.2.1.11 – S16.3.2.2.1  
As this positioning begins (S16.3.2.1.11), the pelvic angle is measured to  $20 \pm 2.5^\circ$ , with the legs positioned with a thigh/leg angle of  $90^\circ$  (as seen in the photo to the right).



As the procedure progresses, different parts of the dummy are positioned, concluding with S16.3.2.2.1, which instructs to “Rest the dummy’s thighs against the seat cushion to the extent permitted by the placement of the feet...” (as seen in the photo to the right).



Toyota is concerned that, with this movement, the pelvic angle may be adjusted out of the range  $20 \pm 2.5^\circ$ . This will effect the test results.

**RECOMMENDATION:** In the final position, the pelvic angle must be  $20 \pm 2.5^\circ$ , therefore, it is not necessary to have the pelvic angle prescribed in the initial position, so long as the final angle is  $20 \pm 2.5^\circ$ . Toyota recommends that after the feet are set, the engineer should ensure a pelvic angle of  $20 \pm 2.5^\circ$ . This can be obtained by pushing the torso forward and then back.